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PATENT
Attorney Docket No. EIC-001

***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES***

APPLICANTS: Michael D. Gilbert
SERIAL NO.: 09/352,976 GROUP NO.: 1771
FILING DATE: July 14, 1999 EXAMINER: Victor S. Chang
TITLE: Electrically Disbonding Materials

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SECOND BRIEF ON APPEAL

This Appeal Brief is submitted in accordance with 37 C.F.R. § 41.37.

REAL PARTY IN INTEREST

The real party in interest is the owner of the present application, EIC
Laboratories, Inc.

RELATED APPEALS AND INTERFERENCES

No other appeals or interferences directly affect or will be directly affected by the
Board's decision in the present appeal.

STATUS OF CLAIMS

The application as filed contained 59 claims. Claims 1, 4-6, 8, 9, 14-26, 28-30, 32, and 66-80 remain pending after entry of the accompanying amendment, which cancels claim 81. In any case, only claims 1, 4-6, 8, 9, 14-26, 28-30, 32, and 66-80 are the subject of this appeal.

STATUS OF AMENDMENTS

The amendment filed contemporaneously herewith cancels claim 81 in response to the Office Action mailed on August 11, 2006 (the “8/11/06 Office Action”) and corrects a typographical error in claim 80.

SUMMARY OF CLAIMED SUBJECT MATTER

In general, the invention relates to materials that may be disbonded from a surface to which they are applied without harm to that surface.¹ In particular, the compositions recited in independent claim 1 include a polymer (in some claims characterized as a “matrix functionality”²) and an electrolyte. The composition exhibits sufficient ionic conductivity to enable a faradaic reaction at a bond formed between the composition and an electrically conductive surface, thereby allowing the composition to disbond from the surface.³

¹ Specification at page 1, lines 10-12.

² See claim 9.

³ Specification at paragraph bridging pages 3-4.

In independent claim 30, the polymeric material comprises an epoxy, and the electrolyte is selected from the group consisting of ion solvating molecules, oligomers and polymers, and ionomers. The composition, when cured, can form adhesive bonds with an electrically conductive surface. The adhesive bonds have a shear strength of greater than 200 psi, and once again, the composition has sufficient ionic conductivity to support a faradaic reaction. This reaction weakens the adhesive bond.

Independent claim 68 recites an electrochemically disbondable composition bonded to a first electronically conducting surface and comprising an adhesive, which incorporates an electrolyte imparting sufficient ionic conductivity to the composition to support a faradaic reaction at the bond between the composition and the electronically conducting surface. A voltage applied across the bond between the first surface and the composition induces the composition to disbond from the first surface.

As explained in the specification, the term “faradaic reaction” means an electrochemical reaction in which a material is oxidized or reduced.⁴ In a typical application, the electrochemically disbondable composition of the invention joins first and second electrically conductive surfaces. The surfaces remain securely joined until an electric current is passed through the disbondable composition to cause a faradaic reaction, whereby the bond is weakened.⁵ Typically, the surfaces may then be separated easily by

⁴ Specification at page 4, lines 18-19.

⁵ Specification at page 7, lines 2-8.

hand. Because the disbonding procedure uses electricity instead of heat or chemical reagents, inadvertent disbonding during normal use is unlikely.⁶

GROUND FOR REJECTION TO BE REVIEWED ON APPEAL

The issues on appeal are whether claims 1, 4-6, 8, 9, 14-26, 28-30, 32, and 68-80 are unpatentable under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 5,441,830 to Moulton et al. ("Moulton") as "evidenced by" U.S. Patent No. 5,565,284 to Koga ("Koga").

ARGUMENT

I. *Neither Moulton nor Koga is Relevant to the Present Invention*

A. *Moulton Does Not Teach Faradaic Disbonding as Claimed*

In the Office Action dated August 26, 2005 (the "8/26/05 Office Action"), the Examiner expressly conceded that Moulton "lacks an express teaching" of the most critical limitation in each of the present claims, namely, "that the composite electrode is electrically disbondable by a faradaic reaction at bonding interface."⁷ The importance of this omission cannot be overstated. It is *the* critical characteristic of the invention that compositionally distinguishes it from conventional adhesives and coatings.

Subsequently, in the 8/11/06 Office Action, the Examiner modified his position. Although recognizing that "Moulton is silent about how a faradaic reaction weakens the

⁶ Specification at page 7, lines 9-16.

⁷ *Id.*

bond,”⁸ the Examiner now contends that a “bond weakening faradaic reaction at the interface, is considered to be inherently present, as evidenced by the Koga reference.”⁹

In other words, unable to offer evidence that the composition of Moulton supports a faradaic reaction, the Examiner simply — and improperly — *infers* this feature. In fact, nothing in Moulton or Koga is even remotely relevant to the claimed invention; both the Examiner’s inference and the premises upon which he bases it are flawed. Before explaining why, however, it is important to establish the standard governing the Examiner’s argument, which he expressly bases on *inherency*.

To establish inherency, the extrinsic evidence “must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991). Moreover, the basis for inherency must be clear; the Federal Circuit has repeatedly held that the relevance of a reference cannot be predicated on “mere conjecture.” *In re Robinson W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 U.S.P.Q. 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851, 105 S.Ct. 172 (1984); *Continental Can, supra*, 948 F.2d at 1268, 20 USPQ2d at 1749 (Fed. Cir. 1991). See also *In re Robertson*, 49 USPQ2d 1949 (1999).

In the present case, not only has the Examiner failed to satisfy the stringent criteria for an inherency rejection; he has not even cited anything relevant to the claims

⁸ 8/11/06 Office Action at page 4.

⁹ *Id.* (Emphasis added.)

he has rejected. In the 8/26/05 Office Action, the Examiner “notes that Moulton’s teaching methods for enhancing the adhesion of composite electrodes onto conductive foils implicitly teaches that while the bond can be enhanced, eventually it can be disbonded, i.e., disbondable.”¹⁰ This is mere wordplay: any bond is “disbondable” given enough effort. The point is that Moulton contains no suggestion that adhesion is affected — i.e., made disbondable — by any electrochemical process at the boundary. The present claims recite a composition that *enables a faradaic reaction* so as to allow the composition to disbond from an electrically conductive surface.¹¹ There is nothing in Moulton that even hints at this possibility.

In the 8/11/06 Office Action, the Examiner states that Moulton’s adhesion promoter “retards the contact of the electrolytic solvent in the composite electrode with the current collector. ... In other words, [in the] absence of the adhesion-promoter coating, the electrolyte in the composite electrode is in contact with the current collector.”¹² This is irrelevant to the present invention.

In fact, what Moulton teaches is that conductive plastic foils may swell due to contact between the current collector and the electrolytic solvent found in the electrode.¹³

¹⁰ 8/26/05 Office Action at page 4 (emphasis in original).

¹¹ Specifically, claim 1 states: “wherein the electrolyte provides sufficient ionic conductivity to said composition to enable a faradaic reaction at a bond formed between the composition and an electrically conductive surface and allow the composition to disbond from said surface”; claim 30 states: “said composition has sufficient ionic conductivity to support a faradaic reaction at said electrically conductive surface, said faradaic reaction weakening said adhesive bonds”; and claim 68 requires “an electrolyte imparting sufficient ionic conductivity to said composition to support a faradaic reaction at the bond between the composition and the electronically conducting surface when a voltage is applied across the bond between the first surface and the composition, thereby inducing the composition to disbond from the first surface.”

¹² 8/11/06 Office Action at page 4.

¹³ Moulton at col. 1, lines 51-55.

This observation is repeated several times,¹⁴ and in fact represents a key problem Moulton seeks to solve. If the solvent comes in contact with the current collector, it may be that electrolyte (i.e., salt) also comes in contact with the current collector. From this, the Examiner seems to infer that a “bond weakening faradaic reaction” is “inherently present.”¹⁵ This conclusion is incorrect; the fact that electrolyte comes into contact with current collector *by no means* implies that a faradaic reaction takes place. Certainly Moulton never suggests this.

Indeed, Moulton implicitly teaches that metal foil current collectors do not suffer from any “inherent, bond-weakening” process. Throughout the specification, claims, and even in the title, Moulton refers to plastic foil current collectors — never to ordinary metal conductive current collectors. Certainly there is no suggestion whatsoever in Moulton that his “adhesion promoter” would provide any benefit to metal foil current collectors.

B. Koga Cannot Supply What Moulton Lacks

Recognizing the deficiencies of Moulton — i.e., that “Moulton lacks an express teaching that the composite electrode is electrically disbondable by a faradaic reaction at bonding [sic] interface”¹⁶ — the Examiner cites the Koga patent. According to the Examiner, Koga “teaches that when an electrode is formed on a current collector, repetition of charge-discharge cycles exacerbates (weakens) the interfacial adhesion

¹⁴ Moulton at col. 2, lines 7-8; col. 2, lines 32-35; col. 4, lines 34-35.

¹⁵ 8/11/06 Office Action at page 4.

(bonding) between the current collector and the electrode[.]”¹⁷ In fact, Koga, like

Moulton, does not teach disbonding via a faradaic reaction at the current

collector/electrode interface:

One of the probable causes is that as the active material is expanded and contracted by doping and dedoping of lithium ions upon charging and discharging, defects occur at the electrode layer-current collector interface, active material-conductive material interface, active material-binder resin interface, etc. Also there arise problems that decomposition of polymer used as the binder by oxidation and reduction upon charging and discharging or swelling or dissolution of the polymer in non-aqueous electrolyte solution exacerbates the interfacial adhesion between the current collector and the electrode layer, and failure of conductor network by swelling of the polymer lowers the conductivity of the electrode layer.¹⁸

Accordingly, *Koga itself* attributes bond weakening to bulk mechanical effects and to general binder decomposition via one or more pathways — oxidation, swelling, or dissolution. The Examiner’s citation of this very passage as showing that “the bond weakening faradaic reaction at the interface is ... inherently present” in Koga¹⁹ is simply incorrect. In effect, the Examiner attributes to Koga a gross error in elementary electrochemistry — namely, that the interface between two electronic conductors (the current collector and the electrode) is the locus of a faradaic reaction.²⁰ But Koga itself commits

¹⁶ 8/26/05 Office Action at page 3. See also 8/11/06 Office Action at page 4, where the Examiner refers to Koga to support his inference that a faradaic reaction occurs in Moulton’s system.

¹⁷ 8/11/06 Office Action at page 4.

¹⁸ Koga, col. 1, lines 48-60.

¹⁹ 8/11/06 Office Action at page 4.

²⁰ For example, the Examiner cites Koga for the proposition that “interfacial adhesion (bonding) between the current collector and the electrode” is weakened, *inter alia*, by “decomposition of the polymer binder by oxidation and reduction (electrochemical or faradaic reactions) upon charging and discharging.” (8/11/06 Office Action at pages 4-5.) But not all oxidations (or reductions) are electrochemical — for example, the burning of coal is a non-electrochemical oxidation. Koga is, in fact, silent as to whether the described polymer oxidation is electrochemical or non-electrochemical. In either case, however, the locus of reaction is the active electrode material, not the current collector/electrode interface.

no such error. Indeed, as explained in the declaration of A.C. Makrides,²¹ what the Examiner proposes is not only inconsistent with Koga's own disclosure, but in fact is not possible: a composite electrode is simply not electrochemically disbondable from its current collector via a faradaic reaction at the interface because the electrode is necessarily an electronic conductor. As such, it cannot support a potential difference at the interface between itself and the current collector, which is crucial for a faradaic reaction. However Koga's bond is weakened, it is not via a faradaic reaction at the current collector/electrode interface.²²

In short, the references cited by the Examiner are not germane to the present claims, whether considered alone or in combination. Certainly they do not meet the demanding standards of inherency.

II. Moulton's Compositions Do Not Fall Within the Present Claims

In the 8/11/06 Office Action, the Examiner states that "the well known art of composite electrode, electrolyte solvent, matrix forming polymer, and current collector foil, taught by Moulton, reads on the disbondable composition, electrolyte functionality, matrix functionality, and electrically conductive surface of the instant invention,

²¹ Declaration of A.C. Makrides, filed June 22, 2005, at ¶12.

²² In fact, as explained by Dr. Makrides in ¶11 of his declaration, "Koga is describing a bulk effect, the expansion and contraction of lithiated and delithiated electrode material which leads to fracture of the material and shedding in Koga's words, of 'fine particles.' As he points out, this is a result of 'numerous repetition of charge-discharge cycles' (Col. 1, line 42) and is unrelated to" disbonding induced by a faradaic reaction at the electrode/collector interface.

respectively.”²³ The Examiner concludes that the “well known electrochemical cell taught by Moulton has the same structure and chemistry as claimed.”²⁴

In fact, it does not. The present claims cover compositions with specific electrical properties (disbonding by a faradaic reaction) that are lacking in Moulton’s compositions. Like all composite electrodes, those described by Moulton are electronic conductors. They must be — otherwise it would not be possible to extract an electric current from a battery. Specifically, Moulton contemplates an electrically conducting adhesion promoter containing 30-80 wt% of “a conductive material”²⁵ and conventionally conductive cathodes and anodes.²⁶ The faradaic reaction required by the present claims, by contrast, *cannot be supported* by an electronic conductor. Therefore, the compositions recited in the present claims differ critically from — and cannot read upon — those of Moulton. To use an analogy, a semiconductor material such as silicon can be doped at such levels that the resulting composition is no longer a semiconductor; a claim reciting a semiconductor would no more read on such compositions than the present claims read on Moulton’s.

The Examiner’s attempts to refute the notion that Moulton does, in fact, teach an electronic conductor are unavailing. He states: “Moulton teaches that the composite electrodes comprise cathodic or anodic materials for the electrochemical reactions to generate current, i.e., they are not merely electronic conductors.”²⁷ But the fact that

²³ 8/11/06 Office Action at page 4 (emphasis in original).

²⁴ *Id.*

²⁵ Moulton at col. 2, lines 54-59.

²⁶ *Id.* at col. 12, lines 9-25 and col. 13, lines 4-12.

²⁷ 8/11/06 Office Action at page 9.

faradaic reactions occur at the electrode/electrolyte interface (and generate or withdraw electronic current to or from the current collector through the electrode) has no bearing on whether a faradaic reaction can occur at the interface between the two electronic conductors, i.e., the current collector and the electrode.

The Examiner seems to attach particular significance to contact of electrolyte with the current collector, stating, "... Moulton also teaches that in the absence of an adhesion-promoter, the electrolyte in the composite electrode is in contact with the current collector, the bond weakening faradaic reaction at the interface, is considered to be inherently present ..."²⁸ And again, "It should be noted that a significant amount of electrolyte is inherently present at the electrode-current collector interface for the above-mentioned reactions, because an ionic conductive electrolyte is necessarily required for carrying out the electrochemical or faradaic reactions."²⁹ Electrolyte is, of course, required at the electrode/electrolyte interface for operation of Moulton's electrode. However, electrolyte is neither required nor necessarily present at the current collector/electrode interface. Neither Moulton nor Koga refers to the presence or absence of electrolyte at the current collector/electrode interface, and in any case, this question is irrelevant to the present claims since they do not recite a composite electrode.

²⁸ 8/11/06 Office Action at page 4.

²⁹ 8/11/06 Office Action at page 5.

III. The Examiner Ignores Key Limitations in the Claims

In the 8/26/05 Office Action, the Examiner makes repeated reference to what he regards as deficiencies in the claim language. These positions, which are neither repeated nor withdrawn in the most recent Office Action, are revealing. They suggest an effort to make up for the inadequacy of the cited art by resorting to a critique of claim language. At page 4 of the 8/26/05 Office Action, for example, the Examiner chides Applicant for “fail[ing] to point any distinct structure and/or composition features in the claim to preclude the prior art” (emphasis in original). At page 5, he “respectfully reminds Applicant that the preamble in claim 1 is directed to a composition, which is read upon [sic] by Moulton,” and “the fact that it can be disbonded easily and reliable [sic] is not recited in any claims of present [sic] application.” On the same page he states that the fact that Moulton’s invention is “disbondable at interface” (emphasis in original) and therefore meets the limitations of claim 1.

Although the Examiner appears to argue that his rejections follow from the claim language, in fact he either ignores the critical claim limitations entirely or misreads the prior art, trying to fit the square peg of a boundary-surface faradaic reaction into the round holes of references that disclose no such thing. Every independent claim requires enablement or support of a faradaic reaction at the adhesive bond to an electrically conducting surface.

The burden is on the Examiner to demonstrate that each feature of a claim is met by a reference or valid combination of references. The courts have repeatedly and consistently held that “all limitations [of a claim] must be considered ... and it is error to

ignore specific limitations in distinguishing over the references.” *In re Boe and Duke*, 184 USPQ 38, 40 (CCPA 1974). Anticipation under 35 U.S.C. §102 requires that each and every element as set forth in Applicant’s claim be found in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). *See also* M.P.E.P. §2131.

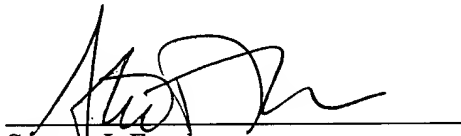
In the 8/26/05 Office Action, the Examiner purports to find fault with the claim language, suggesting excessive breadth; but in fact the fault lies with the Examiner’s failure to give proper weight to the key limitations. In the 8/11/06 Office Action, the Examiner fails to make the case that the limitations he does consider are met by the prior art he cites.

CONCLUSION

For all of the foregoing reasons, we submit that the Examiner's rejections of claims 1, 4-6, 8, 9, 14-26, 28-30, 32, and 66-80 were erroneous, and reversal thereof is respectfully requested.

Accompanying this brief is the fee specified in 37 C.F.R. §1.17(f). Please charge any additional fee occasioned by this paper to our Deposit Account No. 07-1700.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Steven J. Frank", is written over a horizontal line.

Date: November 7, 2006

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CLAIMS APPENDIX

1. An electrochemically disbondable composition, comprising:
a polymer; and
an electrolyte, wherein the electrolyte provides sufficient ionic conductivity to said composition to enable a faradaic reaction at a bond formed between the composition and an electrically conductive surface and allow the composition to disbond from said surface.
- 2-3. (Cancelled).
4. The composition of claim 1, wherein said polymer has a variable crosslink density to form regions of low crosslink density having a relatively high ionic conductivity and regions of high crosslink density having a relatively high mechanical strength.
5. The composition of claim 1, wherein said polymer includes coordination sites that are capable of solvating ions and that support the electrolyte functionality of said composition.
6. The composition of claim 5, wherein said coordination sites are selected from the group consisting of alkoxy moieties, disulfide moieties, thioalkyl moieties, nitrile moieties, and polyvinylidene fluoride moieties and derivatives thereof.
7. (Cancelled).
8. The composition of claim 1, wherein said electrolyte is localized in regions within said polymer to form a secondary phase with ionic conductivity.

9. The composition of claim 1, wherein said electrochemically disbondable composition is a phase separated material having first regions of substantially matrix functionality and second regions of substantially electrolyte functionality.

10-13. (Cancelled).

14. The composition of claim 9, wherein said electrolyte functionality comprises an ion solvating molecule that is selected from the group consisting of low molecular weight alkoxides, alcohols, alkyl carbonates, cyclic esters, nitriles, amides and ureas.

15. The composition of claim 9, wherein said phase separated material comprises a block or graft copolymer containing non-polar components and components of ionic conductivity.

16. The composition of claim 15, wherein said non-polar component of said block copolymer is selected to facilitate phase separation.

17. The composition of claim 1, further comprising a reservoir for containing curing or crosslinking agent.

18. The composition of claim 17, wherein the reservoir is selected from the group consisting of zeolites, clays and polymer gels.

19. The composition of claim 1 or 9, further comprising a salt capable of being solvated into said composition.

20. The composition of claim 19, wherein said salt is selected from the group consisting of alkali metal, alkaline earth and ammonium salts.

21. The composition of claim 19, wherein said salts include an anion selected from the group consisting of hexafluorophosphate, tetrafluoroborate, hexafluoroantimonate and perchlorate.

22. The composition of claim 19, wherein said salt is an ammonium salt and the ammonium cation is immobilized in said composition.

23. The composition of claim 1 or 9, wherein said composition has an ionic conductivity in the range of 10^{-11} S/cm to 10^{-5} S/cm.

24. The composition of claim 1 or 9, wherein said composition has an ionic conductivity in the range of 10^{-9} S/cm to 10^{-7} S/cm.

25. The composition of claim 1 or 9, further comprising an additive selected from the group consisting of pigments, corrosion inhibitors, leveling agents, gloss promoters, rubber tougheners and fillers.

26. The composition of claim 1 or 9, wherein said composition is an adhesive.

27. (Cancelled).

28. The composition of claim 1 or 9, wherein said composition is a coating.

29. The composition of claim 28, wherein said coating is resistant to delamination from a substrate to which it is applied.

30. A composition, comprising:

a curable polymeric material comprising an epoxy; and

an electrolyte located in said curable polymeric material, said electrolyte being selected from the group consisting of ion solvating molecules, oligomers and polymers, and ionomers,

wherein said curable polymeric material, when cured, can form adhesive bonds with an electrically conductive surface, said adhesive bonds having a shear strength of greater than 200 psi, and said composition has sufficient ionic conductivity to support a faradaic reaction at said electrically conductive surface, said faradaic reaction weakening said adhesive bonds.

31. (Cancelled).

32. The composition of claim 30, wherein the composition phase separates upon curing, said phase separated material having first regions of mechanical strength and second regions of ionic conductivity.

33-65. (Cancelled).

66. The composition of claim 30, wherein said curable polymeric material has an ionic conductivity in the range of 10^{-9} to 10^{-7} S/cm.

67. The composition of claim 1, wherein said composition has a shear strength greater than 200 psi.

68. An electrochemically disbondable composition bonded to a first electronically conducting surface and comprising an adhesive incorporating an electrolyte imparting sufficient ionic conductivity to said composition to support a faradaic reaction at the bond between the composition and the electronically conducting surface when a voltage is applied across the bond between the first surface and the composition, thereby inducing the composition to disbond from the first surface.

69. The composition of claim 68, wherein said adhesive is selected from the group consisting of epoxies, phenolics, acrylics, melamines, maleimides, polyurethanes, and combinations thereof.

70. The composition of claim 68, wherein said electrolyte is localized in regions within said polymer to form a secondary phase with ionic conductivity.

71. The composition of claim 70, wherein said electrolyte is selected from the group consisting of ion solvating molecules, oligomers, polymers, and ionomers.

72. The composition of claim 70, wherein said electrolyte comprises an ion solvating molecule that is selected from the group consisting of low molecular weight alkoxides, alcohols, alkyl carbonates, cyclic esters, nitriles, amides and ureas.

73. The composition of claim 68, further comprising a salt.

74. The composition of claim 73, wherein the salt is selected from the group consisting of alkali metal, alkaline earth, and ammonium salts.

75. The composition of claim 73, wherein the salt includes an anion selected from the group consisting of hexafluorophosphate, tetrafluoroborate, hexafluoroantimonate and perchlorate.

76. The composition of claim 73, wherein the salt is an ammonium salt and the ammonium cation is immobilized in said composition.

77. The composition of claim 68, wherein said composition has an ionic conductivity in the range of 10^{-11} S/cm to 10^{-5} S/cm.

78. The composition of claim 1, wherein a bond formed between the composition and an electrically conductive surface is substantially weakened by application of an electrical voltage of 50 volts after less than about 60 minutes.

79. The composition of claim 68, wherein the bond is substantially weakened by application of an electrical voltage of 50 volts after less than about 60 minutes.

80. The composition of claim 1, wherein the polymer constitutes at least 50% by weight of the composition.

EVIDENCE APPENDIX

There has been no evidence submitted under 37 C.F.R. 1.130, 1.131 or 1.32 in this case.

RELATED PROCEEDINGS APPENDIX

There have been no proceedings related to this case.